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First Named Inventor	HINER ET AL.
Group Art Unit	
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(use as many sheets as necessary)

Sheet	1	of	1
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U.S. PATENT DOCUMENTS

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FOREIGN PATENT DOCUMENTS

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TDB-ACC-NO: NN9311589

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TDB-ACC-NO:
DISCLOSURE

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Microstructured Solder Mask by Means of Laser

PUBLICATION-

IBM Technical Disclosure Bulletin, November 1993,

VOLUME 36

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CROSS 0018-8689-36-11-

DISCLOSURE TEXT:

Disclosed is a process that allows the manufacture of solder masks by adding step of laser ablation to the standard process of manufacturing printed circuit boards (PCB). - In contrast to the photolithographical exposure, the structuring of probimer material by means of laser ablation does not depend on the particle size of the photosensitive probimer component. - For polymer materials such as probimer, pulsed excimer lasers are especially useful. The irradiated material nearly completely turns into the gaseous state by means of photochemical/photothermal processes. - Solid reaction products which deposit as carbon-consisting layers in the environment of the ablated areas, can be removed either by standard oxygen plasma etching or by a subsequent short flood exposure with an excimer laser using low power densities. - By means of laser ablation it is easily possible to create structures down to about 10 nm for the necessary layer thicknesses of about 40 nm, e.g., by projection of suitable mask structures. - The vertical profiles of the produced trenches (between about 30° and 89°, i.e., nearly vertical walls) can be manufactured either by the choice of adequate masks or by the choice of suitable laser power densities. - Laser ablation can easily be carried out in such way that the ablation process stops automatically after breaking through the probimer layer, i.e., when reaching the copper layer, since the power densities, which will lead to copper ablation, are very much higher than the densities necessary for ablation of the probimer layer. - The control of the horizontal vertical dimensions of the trenches produced by laser ablation in the above described way is an important prerequisite for a well defined solder process, because the volume of the ablated trench has to match exactly with the volume of solder material to be supplied. The manufacturing process of the solder mask can be effected in two steps. - The solder structures having rough dimensions, which will constitute the major part of the PCB, even in the future, should be built up now as before using standard lithography. - Only the small areas, which are intended for soldering on chips directly (direct chip attach, DCA) and which need finely structured solder places, should be produced by means of laser ablation. This will have the advantage that masks for laser ablation are very small and will be easy to produce and to handle.

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